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Mechano-electrical fuse for a hand grenade

The invention concerns a mechano-electrical fuse for a hand grenade as set forth in the classifying portion of claim 1.

Such a mechano-electrical fuse for a hand grenade is known from EP 0 781 975 B1. In that known mechano-electrical fuse the spring element provided for storing mechanical energy is formed by a mechanically prestressed coil spring. The handle lever of that known hand grenade is combined in per se known manner with a mechanically stressed tensioning spring. The mechanically stressed coil spring is connected to a drive device for driving an electrical generator. When the safety device for the lever is released, the coil spring is also relieved, in addition to the tensioning spring associated with the lever, whereby the electrical generator is driven. The detonator of the hand grenade is activated by means of the electrical energy produced by the electrical generator. The detonator then fires the booster charge, by means of which the explosive in the hand grenade is fired. A barrier is provided between the detonator and the booster charge in order to prevent unwanted premature firing of the booster charge.

In the case of that known hand grenade material fatigue for the coil spring, which cannot be reliably ruled out, represents a problem. This has an effect on the reliability of that hand grenade.

The object of the invention is to provide a mechano-electrical fuse for a hand grenade, which is of a comparatively simple design and which is of relatively small structural size so that it can also be installed in existing hand grenades without problem.

In accordance with the invention, in a mechano-electrical fuse of the kind set forth in the opening part of this specification, that object is attained by the features of the characterising portion of claim 1. Preferred

developments and embodiments of the mechano-electrical fuse according to the invention for a hand grenade are characterised in the appendant claims.

By means of the mechano-electrical fuse according to the invention it is readily possible to satisfy current and future demands from customers, in which respect it is possible for the respectively desired delay times to be adjusted by means of the time delay circuit of the fuse according to the invention – to correspond to the respective national demands – prior to fitting of the mechano-electrical fuse in the hand grenade.

Further details, features and advantages will be apparent from the description hereinafter of an embodiment, illustrated in the drawing, of the mechano-electrical fuse according to the invention and a hand grenade having such a mechano-electrical fuse. In the drawing:

Figure 1 is a view in section through the mechano-electrical fuse,

Figure 2 is a view in section taken along section line II-II in Figure 1 through the mechano-electrical fuse, that is to say in a section plane turned through 90°, and

Figure 3 is a view in section through a hand grenade provided with a mechano-electrical fuse as shown in Figures 1 and 2.

Figure 1 shows a configuration of the mechano-electrical fuse 10 with a housing head 12 and a housing sleeve 14 which jointly form a fuse housing 16.

Mounted to the housing head 12 is a handle lever 18. The handle lever 18 is displaceable about a lever spindle 20 between the inactive position shown in Figure 1 and an active position in which it pivots outwardly in the anti-clockwise direction about the lever spindle 20. The lever 18 is temporarily secured in the illustrated inactive position by means of a safety device 22. Provided between the housing head 12 and the lever 18 is a tensioning spring 24 which in the form of a cylindrical coil spring is arranged around the lever spindle 20. The tensioning spring 24

bears with its one end portion 26 against the housing head 12 and with its second end portion 28 against the lever 18. The tensioning spring 24 is mechanically stressed in the illustrated inactive position of the lever 18. When the safety device 22 is released from the mechano-electrical fuse 10 the tensioning spring 24 can be relieved.

Disposed in the fuse housing 16 is an electrical generator 28 which for example can be a microgenerator from Kinetron bv, 5025 RS Tilburg, Netherlands. The electrical generator 28 has a generator shaft 30 on which a flywheel mass 32 is fixed. The generator shaft 30 is connected by way of a step-down transmission 34 to a barrier displacement shaft 36. A barrier 40 is fixed to the end 38, which is remote from the step-down transmission 34, of the barrier displacement shaft 36. As can be seen from Figure 2 in which identical details are denoted from the same references as in Figure 1, the barrier 40 has two identical barrier discs 42 and 44 which are of different thicknesses. The barrier 40 is arranged between a detonator 46 and a booster charge 48. The booster charge 48 is located at the lower end portion of the housing sleeve 14. The detonator 46 is provided immovably in a compartment 50 which is provided in a circuit body 52. The circuit body 52 is fixed in the housing sleeve 14. It serves for supporting the barrier displacement shaft 36 and it is provided with a frame 54, as can be seen from Figure 2.

The electrical generator 28 is connected together with the detonator 46 by way of an electronic time delay circuit 56. That switching connection is identified by reference 58 in Figure 1. Figure 1 also clearly shows that the electronic time delay circuit 56 is provided on two circuit boards 60 and 62 which are mounted to the frame 54 of the circuit body 52 at a spacing from each other and facing away from each other. The barrier displacement shaft 36 extends between the mutually spaced circuit boards 60 and 62.

The time delay of the electronic time delay circuit 56 can be set in a given time window, prior to assembly of the mechano-electrical fuse 10. The time delay can be for example 4.5 to 6 seconds.

The two barrier discs 42 and 44 of the barrier 40 provided between the detonator 46 and the booster charge 48 each have an eccentric through hole 64, 66 (see Figure 1), the holes being in mutual alignment.

Figure 1 shows the mechano-electrical fuse 10 in its inactive position with the lever 10 in the safe condition. In that condition, the through holes 64 and 66 in the barrier discs 42 and 44 of the barrier 40 are on one side in relation to the barrier displacement shaft 36 and the detonator 46 is on the diametrally opposite side.

A cable line 68 is fixed with its one end 70 to the generator shaft 30. Adjoining that first end 70 a number of turns 72 are wound around the generator shaft 30 in closely contacting relationship. The cable line 68 extends in sealing relationship out of the housing head 12 of the mechano-electrical fuse 10, and it is fixed with its second end 74 to the lever 18.

In the inactive, safe condition of the mechano-electrical fuse 10 the cable line 68 is provided without slack between the generator shaft 30 and the lever 18, that is to say it is taut.

When the safety device 22 is released from the mechano-electrical fuse 10, the associated tensioning spring 24 can be mechanically relieved. In that situation the lever 18 is pivoted out in Figure 1 in the anti-clockwise direction about the lever spindle 20 and the generator shaft 30 and consequently the electrical generator 28 are caused to rotate by way of the cable line 68. The electrical generator 28 is suitably driven by means of the flywheel mass 32 fixed to the generator shaft 30, so that the electronic time delay circuit 56 is supplied with the necessary electrical power, by means of the electrical generator 28. At the same time, when the generator shaft 30 rotates, the barrier displacement shaft 36 is caused to perform a rotational movement, suitably stepped down by way of the

step-down transmission 34, with the barrier 40 being rotated for example through 180° in such a way that the through holes 64 and 66 of the barrier discs 42 and 44 of the barrier 40 come into coincidence, that is to say align with the detonator 46. In that way the detonator 46 can then activate the booster charge 48.

As already mentioned the electronic time delay circuit 56 can be preset for example with a time delay of 4.5 to 6 seconds. In comparison the barrier 40 is armed for example after 3 seconds after release of the safety device 22, thus affording a reliably effective mechano-electrical fuse 10.

Figure 3 shows a hand grenade 76 with a mechano-electrical fuse 10, as has been described hereinbefore with reference to Figures 1 and 2. It will be seen from Figure 3 that the mechano-electrical fuse 10 is of such a small structure, that is to say it is of such dimensions, that the booster charge 48 is disposed virtually at the centre of the explosive 78 of a known hand grenade 76.

Reference 80 identifies a fragmentation casing of the hand grenade 76.

The hand grenade 76 has a lower housing portion 82 and an upper housing portion 84 which are connected together. The upper housing portion 84 usually has an upwardly open central portion 86 in which the mechano-electrical fuse 10 is arranged. The space 88 which remains in the central portion 86 in front of the booster charge 48 can be equipped with a further charge 90.

Identical details are denoted in Figures, 1, 2 and 3 by the same respective references so that there is no need for all features to be described in detail again with reference to the Figures.

Figure 2 also clearly shows a shearing element 92, by means of which the flywheel mass 32 is releasably connected to the fuse housing 16 or the housing head 12 thereof in the inactive rest condition, that is to say

in the condition of the lever 18, in which it is secured by the safety device 22.

List of references

10 mechano-electrical fuse

12 housing head (of 16)

14 housing sleeve (of 16)

16 fuse housing

18 lever (of 10)

20 lever spindle (for 18)

22 safety device (for 16)

24 tensioning spring (between 12 and 18)

26 first end portion (of 24 at 12)

28 electrical generator (in 12)

30 generator shaft (of 28)

32 flywheel mass (at 30)

34 step-down transmission (between 30 and 36)

36 barrier displacement shaft (for 40)

38 end (of 36 for 40)

40 barrier (between 46 and 48)

42 barrier disc (of 40)

44 barrier disc (of 40)

46 detonator (of 10)

48 booster charge (of 10)

50 compartment (in 52 for 46)

52 circuit body (for 56)

54 frame (of 52)

56 electronic time delay circuit (at 54)

58 switching connection (between 56 and 46)

60 circuit body (of 56)

62 circuit body (of 56)

64 through hole (in 42)

66 through hole (in 44)

68 cable line (between 30 and 18)

70 first end (of 68 on 30)
72 turns (at 70 on 30)
74 second end (of 68 at 18)
76 hand grenade
78 explosive (of 76)
80 fragmentation casing (of 76)
82 lower housing portion (of 76)
84 upper housing portion (of 76)
86 central portion (of 84 for 10)
88 space (in front of 48 in 86)
90 charge (in 88)
92 shearing element